

NOAA DIVING NEEDS SURVEY AND ASSESSMENT

DESCRIPTION OF DIVING SYSTEMS, TECHNIQUES, AND CERTIFICATIONS

Note: The following information is provided to assist the user in completing the NOAA Diving Program - Diving Needs Survey and Assessment.

Decompression Diving

- Capability/Description – Decompression diving involves diving beyond the standard, no-decompression time/depth limits and requires one or more mandatory decompression stops during ascent. Failure to make the required in-water stops is a violation of the decompression tables and may result in decompression sickness (aka., “the bends”). The rationale for using decompression diving is to extend divers’ bottom time. Decompression diving is a diving procedure and is not limited to a specific type of equipment (i.e., open-circuit scuba and surface-supplied, semi-closed circuit, fully closed-circuit).
- Equipment & Cost – With the exception of open-circuit scuba diving, equipment used for decompression diving is no different than that used for no-decompression diving. Decompression diving using open-circuit scuba equipment requires additional equipment that typically costs ≈ \$3.0K per diver. There are also additional costs when using mixed gases (i.e., trimix or heliox) in lieu of air that must be considered.
- Training – The specific requirements for decompression dive training depends on the type of equipment and the breathing gas used. Decompression diving using mixed gases and/or rebreathers requires more extensive training than does open-circuit scuba with compressed air. Cost for training varies from \$1.5K - \$3.0K per diver depending on the equipment and breathing media.
- Proficiency – Divers would need to meet current NOAA standards for diving proficiency, using the type of equipment for which they are trained.

Semi-Closed Rebreather

- Capability/Description – Semi-closed rebreathers (SCR) are typically used for shallow (<130fsw) no-decompression diving. SCRs use nitrox or mixed gas injected into a breathing loop, and a CO₂ scrubber to extend gas supply and bottom time. Injected gas fraction remains constant during the dive, but gas partial pressure varies with depth and exertion level. During operation SCRs emit a small stream of bubbles or gas “burp.” SCRs are more efficient than open-circuit (in terms of gas usage), but less efficient than closed-circuit.
- Equipment & Cost – Semi-Closed units cost approximately \$3K - \$4K+ and maintenance and operational costs run higher than open-circuit, but less than closed-circuit.
- Training – A typical training course requires classroom work, pool sessions, 4+ open-water dives, and combined dive bottom time of 4+ hours.
- Proficiency – Divers would need to meet current NOAA standards for diving proficiency, using the semi-closed rebreather for which they are trained.

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Closed-Circuit Rebreather

- Capability/Description – Fully closed-circuit rebreather (CCR) are used for both shallow decompression and no-decompression diving, as well as deep decompression diving. CCRs use oxygen and a diluent gas (air, nitrox, trimix, etc.) in a closed breathing loop, and a CO₂ scrubber to extend gas supply and bottom time. The partial pressure of oxygen in the breathing loop is monitored and maintained at a preset level throughout the dive. The optimum gas mix to minimize decompression, avoid oxygen toxicity, and maximize bottom time can be maintained at all times with this system. Gas is vented from the breathing loop only during ascent. Adequate open-circuit bail-out capability (reserve gas capacity) must be maintained in case of breathing loop/scrubber failure.
- Equipment & Cost – Units range in price from \$5K - \$20K+. Maintenance costs and requirements are higher than both open-circuit scuba and semi-closed rebreathers.
- Training – A typical training course for no-decompression diving would require classroom work, pool sessions, 6 – 8 open water dives, and 8 – 12 hours of combined dive bottom time. Shallow decompression diving would require additional training. Deep decompression diving would typically require prior dive experience with the unit to be used, additional classroom work, pool sessions, and 8+ additional training dives including several deep dives.
- Proficiency - Divers would need to meet current NOAA standards for diving proficiency, using the closed-circuit rebreather for which they were trained. Divers conducting decompression diving would need to perform proficiency or project dives using deep/decompression diving techniques meeting current NOAA standards.

Polluted-Water Diving

- Capability/Description – The minimum diver dress for mildly polluted water would be a smooth skinned (vulcanized rubber) dry suit with latex hood, ring locked dry gloves, and an AGA full-face mask. More polluted water would require a modified surface supplied diving helmet mated to a locking ring on the dry suit. Tenders, air manifold operator, decontamination team, diving supervisor, and standby dive team would be required for diving in anything other than mildly polluted water. Diver decontamination and collection of decontamination run-off may be required for more than mildly polluted water.
- Equipment Cost – Polluted water diving equipment requires more frequent maintenance and replacement depending upon the diving environment. Initial equipment costs would range from \$3K – \$15K+.
- Training – Commercial training programs are not widely available. The NOAA Diving Center would design and conduct a training program to meet proposed project needs.

Scientific versus Working Certifications

- Scientific – Primary tasks are that of observer and data gatherer. Divers may use simple light hand tools to perform underwater scientific tasks. Divers are certified by a recreational diving agency before receiving a NOAA certification by a local NOAA diving unit supervisor. Divers may NOT perform ship husbandry tasks, use hydraulic, electric, or

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pneumatic tools, use heavy hand tools, move heavy objects, undertake any construction or salvage work, or participate in activities typically associated with commercial diving.

- Working – May perform both scientific diver tasks, and tasks commonly associated with commercial diving (ship husbandry, underwater cutting, moving heavy objects, etc.) that they are qualified to perform. Divers have been trained by the NOAA Diving Program, commercial or military diving programs, or have substantial prior experience in conducting similar tasks.